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VTAPE: A PROCEDURE FOR DECIPHERING EXTERNAL MAGNETIC TAPES OF UNKNOWN FORMATS

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Canada

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ABSTRACT

The program VTAPE describes a procedure for deciphering magnetic tapes having unknown formats as normally obtained from external sites. It may be used to determine the format of the magnetic tape and to copy its contents to some directory or file space on the disk structure. Also, commands are included to set the hardware parameters (density, parity and hardware data mode) as well as to permit command recognition and provide internal help.

Furthermore, the description gives the two main modes of operation: the first allows deciphering formats, positioning the tape, and viewing the magtape contents; the second allows for copying of the magtape contents, positioning the tape and setting the blocking format for copying. In addition, advanced features, such as error reporting, are provided.

Finally, examples are included to facilitate its use, either interactively or in batch mode, by the scientist or other user who might not be familiar with the technical aspects of magnetic tapes.

RESUME

Le programme VTAPE décrit une procédure à suivre pour déchiffrer les bandes magnétiques de formats inconnus provenant, dans la plupart des cas, de centres extérieurs. Il peut être utilisé pour établir le format d'une bande magnétique ou pour en reproduire le contenu dans l'espace d'un répertoire ou d'un fichier dans une structure de disque. Il comporte également des instructions visant à fixer les paramètres du matériel (densité, parité et mode des données du matériel), de même qu'à identifier les diverses instructions et à fournir une assistance interne.

De plus, cette description expose les deux principaux modes d'exploitation: le premier assure le déchiffrage des formats, le positionnement de la bande, l'examen du contenu d'une bande magnétique et le second, la reproduction du contenu d'une bande magnétique, le positionnement d'une bande et le réglage du format de groupage pour la reproduction. Elle comprend, en outre, des fonctions évoluées, comme la signalisation des erreurs.

Enfin, des exemples en faciliteront l'utilisation, en mode interactif ou par lots, par les scientifiques ou autres utilisateurs pour qui les aspects techniques des bandes magnétiques ne sont pas familiers.

Table of Contents

Section	Page
Abstract	ii
1. Introduction	1
2. User's Guide	1
2.1 Identification	1
2.2 Hardware Environment	2
2.3 Software Environment	2
2.4 Purpose	2
2.5 Outline of Working	2
2.6 Operations	3
2.6.1 Operating System Commands	3
2.6.2 Global Magtape Parameters	4
2.6.3 SCAN Mode	8
2.6.4 COPY Mode	11
2.6.5 Summary of the Command Modes	13
2.7 Restriction and Limitations	13
2.8 Entry and Exit	14
2.9 Testing and Verification	14
2.10 Memory Requirements	14
3. Examples of Use	14
3.1 Obtaining the Blocking Format	14
3.2 Displaying the Text Contents	16
3.3 Displaying Both the Byte and Text Contents	17
3.4 Copying a File from Magtape	18
3.5 Advanced Features	19
3.5.1 Error Reporting	19
3.5.2 Reading Past the End of Tape	19
4. Concluding Remarks	20

Appendix	Page
A. Quick Reference to Input Requirements	21
A.1 Getting Started	21

A.2 Global Magtape Parameters 21
A.3 SCAN Mode 21
A.4 COPY Mode 22

References 23

1 Introduction

The System Program VTAPE (View Magnetic TAPE) was designed to aid the scientist and the computer user in deciphering magnetic tapes obtained from external sites. Commands exist within the program to either view the contents of the magnetic tape (magtape) in many different display formats, or to read from the tape using one of the available hardware modes.

With this program, the user may determine the format of the magtape even if that information was not available or has been lost. Once the format has been obtained, the contents of the magtape may be copied to the user's own area on disk using the same program. VTAPE has the additional features of internal help and command recognition to aid the user in his tasks of deciphering the information on the magtape.

The basic concept for this program was developed by D.J. Chiasson, DREA, in 1973 for the Honeywell 316 Computer System, and implemented by Carl Mihoff, DREA, for the DREA DECsystem-20 Central computing facility in 1979. Since then, many new functions and commands were added to enhance the capabilities of VTAPE to allow for viewing the contents of the magtape in many different display formats, for translating data of foreign hardware modes, and for the copying of the magtape information into a usable format.

This document gives a comprehensive description on the use of the VTAPE program. It is to be noted that the current concept and version of VTAPE are original with the author.

2 User's Guide

This section describes the available commands in the VTAPE program and their functionality. It is the intention of the author that this section be self-contained and serve as a guide for the user.

2.1 Identification

Program VTAPE
for Viewing and Reading of Magnetic TAPEs

Author: Peter J. Gergely, DREA, Dartmouth, N.S.

Creation Date: August 1981
Latest Revision: November 1983

2.2 Hardware Environment

Written for a DECsystem-20 mainframe with at least one magnetic tape drive.

2.3 Software Environment

Requires the TOPS-20 operating system (Version 4 or greater), with the MACRO Assembly Language. VTAPE may be run either in batch or interactive mode. In many applications, the program should be used interactively to take full advantage of its versatility.

2.4 Purpose

VTAPE may used to determine the format of the magtape, and then to copy its contents to the disk structure. Commands exist to set the hardware parameters of the magtape (such as the density, the parity, and the hardware data mode) for both of the input modes. Also, command recognition and internal help are included in this program.

The program has two main modes of operation. The first one, SCAN mode, is used to determine the format that the tape is written in. The user may display the blocking format of the magtape, or the individual records on the magtape, or both. The individual records can be shown in a variety of forms. Other commands in this mode allow the tape to be positioned.

The second mode of operation is the COPY mode. Here, the user may copy the contents of the magtape to some directory (or file space) accessible by him on the computer system. Commands exist to position the magtape, and set the blocking format used in copying.

2.5 Outline of Working

The fundamental building block for VTAPE is the MTOPR% JSYS.[1] This monitor call performs various device-dependent control functions. It is used to set the density, the parity, the hardware data mode, and for positioning the magtape. Combined with the MTOPR% call are an assortment of other monitor calls used for reading the magtape, translating between the hardware data modes, and interpreting user input.

---

[1] A monitor call, or JSYS, is a command to the monitor and is performed when the program is executed. Monitor calls are used to request monitor functions, such as input or output of data (I/O), job information, special interrupt functions, dismissing a job, error handling, and number conversions **[Monitor Calls User's Guide, 1982]**. More information can be found in **[Monitor Calls, 1982]**.

Normally, the user would first scan the magtape to determine its format, and then proceed to copy its contents to the destination directory.

2.6 Operations

It is recommended that VTAPE be used in interactive mode as the user must make decisions as to which directions to take. If the contents and the format of the magtape are well known, then the program may be run in batch mode.

In this section, the instructions required to use VTAPE will be fully explained. A quick reference sheet on the instructions is presented in Appendix A. The description of the instruction set is best given in four parts: Operating System Commands, Global Magtape Parameters, SCAN mode, and COPY Mode. The notation used will be:

Prompt> **Command** (guide words){**options**} (Reference Number)

All input is performed by the COMND JSYS.[2] Due to this JSYS, the user may type a question mark to obtain the options at the current point of the input line. Help exists in many forms: the question marks list all current options, the escape completes or finishes typing a command if it can recognize what you are trying to do and provide guide words to prompt you, and finally the HELP command gives more information on other commands (see Section 2.6.2). The last input on each command line is a carriage-return (typed with the return-key).

2.6.1 Operating System Commands

Before using VTAPE or any other tape handling facilities, the user should assign the magnetic tape unit that he will be using by typing:

---

[2] The COMND JSYS parses one field of a command that is typed by a user. When this monitor call is used to read a command from a terminal it provides the following features: 1) Allows the input of a command (including the guide words in parenthesis) to be given in abbreviated, recognition (ESC or CTRL/F), and/or full input mode. 2) Allows the user to edit his input with the DELETE, CTRL/U, CTRL/W, and CTRL/R editing keys. 3) Allows fields of the command to be defaulted if an ESC (or escape), or CTRL/F is typed at the beginning of any field, or if any field is omitted entirely. 4) Allows a help message to be given if a question mark (?) is typed at the beginning of any field. 5) Allows input of an indirect command file (with "@" and a filename) that contains the fields for all or the remainder of the command. 6) Allows a recall of the correct portion of the last command (up to the beginning of the field where an error was detected) if the next command line begins with CTRL/H. The correct portion of the command is retyped, and the user can then continue typing from that point. **[Monitor Calls, 1982]**

ASSIGN MTAu:

where "u" is the unit number of the drive.[3] For information, VTAPE will only work on a magtape unit having unlabeled tape support.[4] The user then runs the program by typing:

RUN PS:<TAPELIB>VTAPE (2-1)
PS:<TAPELIB>VTAPE (2-2)

The program will start and request the magtape tape unit by:

Device: **MTAu: {comma + CR, or CR}** (2-3)

where "u" is the unit number of the magtape drive. The first option of a comma and a carriage return (CR) will place the user in the command mode of the program (see Section 2.6.2). The second option of just carriage return will rewind the magtape and start scanning the tape in industry standard mode (see Section 2.6.3).

2.6.2 Global Magtape Parameters

Once VTAPE enters command mode, the user may set certain global parameters to be used when processing the magtape, such as the density, hardware mode and parity. The user is notified that he is at this level by the VTAPE> prompt. The following commands are available at this level. The list of commands is available by typing a question mark immediately after the prompt, as in

```
VTAPE>  ? one of the following:
 BUFFER-SIZE   COPY          DENSITY        ERRORS         HELP
 MODE          NO            PARITY         SCAN           SHOW
  or a carriage return to exit this level
```

There are two commands which are not normally displayed: **ABORT** and **EXIT**. The **ABORT** command terminates the program immediately and returns the user to the TOPS-20 Operating System (or EXEC). The **EXIT** command terminates the current command level and returns the user to the input request for the device (Line (2-3)).

If the user types a CTRL-E (holding the CTRL key and typing an "E"), the current function that is being performed will be interrupted and the user returned to the command parser for that mode. For example, typing a CTRL-E while the tape is being scanned will immediately return the user to the SCAN> prompt (see Section 2.6.3). Normally, typing

---

[3] We currently have 3 magtape units at DREA: MTA0:, MTA1:, MTA2:.

[4] Unlabeled tape support implies that the magtapes do not have filename headers and volume headers. An unknown tape may have these, but this will be apparent from the format of the tape (see Section 2.6.3).

a carriage return with no command on a line will cause the program to go to the previous input level as the default is to EXIT.

VTAPE> **BUFFER-SIZE** (maximum is) **{pages}** (2-4)

Sets the maximum buffer size in pages[5] that can be used for transfers and magtape reads. The program starts off with a buffer size of 8 pages, but the user may request as many as 16 pages. This command is only necessary if the user receives an error message stating that the record length is incorrect. If the word CALCULATE is used in place of the number of pages, the program will attempt to calculate the current operating system maximum and set the buffer size appropriately.

VTAPE> **COPY** (submode) (2-5)

Enters COPY mode. Please refer to Section 2.6.4 for greater detail.

VTAPE> **DENSITY** (of the magtape is) **{density}** (2-6)

Sets the density of magtape operations. The value for **density**, in bits per inch (BPI), may be one of the following: 200, 556, 800, 1600, 6250, or SYSTEM-DEFAULT.[6]

VTAPE> **ERRORS** (are to be shown) (2-7)

Turns on error reporting to the user. This is the opposite of the **NO ERRORS** command.

VTAPE> **HELP** (on) **{subject}** (2-8)

Types out the help message that is available for the given subject. Help is available on the following subjects: BUFFER-SIZE, COMMANDS, COPY (has subcommands), DENSITY, HELP (the default message), MODE, PARITY, SCAN (has subcommands), and SHOW.

---

[5] One page on the DEC-20 is defined to be 512 decimal or 1000 octal words. One word is comprised of 36 bits.

[6] The density of 6250 BPI will not work on our current magnetic tape drives (TU45 Tape Drives).

For example, typing **HELP COMMANDS** will result in the message:

```
The possible commands are:
        Control-E -- Interrupts the currently active subcommand.
        carriage return -- Exits this level returning to the top one
                           where you were prompted for a device.
        BUFFER-SIZE -- Sets the maximum buffer size used for tape
                       transfer to the given number of pages.
        COPY -- Enters the copy submode for copying magtapes.
        DENSITY -- Sets the density of the magtape.
        ERRORS -- Turns on error reporting
        MODE -- Sets the hardware mode of the magtape.
        NO -- Turns off some features.  The only possible keyword
              is ERRORS.
        PARITY -- Sets the parity of the magtape.
        SCAN -- Enters the scan submode for checking the format of the
                magtape.
        SHOW -- Shows the current settings.
```

VTAPE> **MODE** (type is) {**hardware mode**} (2-9)

Sets the hardware mode that is used in reading the magtape. The hardware mode determines the word size, and the byte size (or the number of bits per character) used in the transfers.

The user may set one of the following **hardware modes**:[7]

ANSI-ASCII Sets the format to ASCII using 7-bit characters and a word size of 36-bits. That is, five characters fit in one word.

CORE-DUMP Sets the format to CORE-DUMP, implying 36-bits in one character as well as one word. This implies that the transfer will be in binary.

EBCDIC Sets the format to EBCDIC using 8-bit characters, and a word size of 32 bits. There are only 4 characters per word. Most commercial tapes will either be in this format or INDUSTRY-COMPATIBLE. There is a slight incompatibility between commercial tapes written in EBCDIC. Because of this, the **MODE EBCDIC** command accepts either **DEC** (the default), **IBM**, or

[7] Greater detail on the hardware modes is available in **[Tape Processing Manual, 1982]**.

	TEKTRONIX as a subcommand. These three tables have a different character conversion value on certain special symbols such as "\" and "{".
HIGH-DENSITY	Packs nine 8-bit characters in two 36-bit words.[8]
INDUSTRY-COMPATIBLE	States that the tape transfers will be using 8-bit characters on a 32-bit word implying four characters per word. The read format will be in ASCII. This is the default on program start-up.
SIXBIT	Uses 6-bit characters in a 36-bit word. This assumes that 6 characters will fit in one word.
SYSTEM-DEFAULT	Gives the same result as CORE-DUMP.[9]

VTAPE> **NO ERRORS** (are to be shown) (2-10)

The NO ERRORS command turns off error reporting to the user. Do not use this option unless it is certain that no errors will occur while working with the magtape. This is the opposite of the **ERRORS** command.

VTAPE> **PARITY** (of the magtape is) {**parity**} (2-11)

Allows the user to set the parity of magtape reads. Acceptable values are either **ODD** (the default) or **EVEN**.

VTAPE> **SCAN** (submode) (2-12)

Enters SCAN mode. Please refer to Section 2.6.3 for greater detail.

VTAPE> **SHOW** (current settings) (2-13)

Shows the current settings at this command mode. The following is an example of the output returned by this command.

```
Magnetic Tape Device:  MTA1:
   MTA1: is currently positioned after file 27, 621 records from BOT.

   Error Reporting:  Off
   Buffer size:  8 Page(s), or 10000 octal = 4096 decimal words
   Density:  1600 BPI (63 rows/mm)          Parity:  Odd.
   Hardware mode:  Industry compatible mode (8-bit bytes, 32-bit words)
```

---

[8] This is currently unavailable on our magtape drives (TU45 tape units).

[9] This may change depending on the setting in the operating system.

The display will show which magtape device is being used, what position the tape is at (could be at beginning of tape or BOT), what the maximum buffer size is.[10] The density, parity, and hardware mode used in reading the magtape are also displayed.

The **SHOW** command may be used in the SCAN and COPY modes. The output will be approximately the same, with some mode specific additions.

2.6.3 SCAN Mode

This mode is used for examining the format and the contents of the magtape. The number of records of equal length comprising the files may be displayed. One option allows the user to examine individual bytes from each record in either numeric, text, or both formats.

SCAN mode is entered by typing SCAN as a global magtape command (see Section 2.6.2). If a carriage return is typed with no other text on the input line then the program will return to the next higher input level (i.e., the general magtape commands). The format of the magtape may be displayed quickly by typing,

```
PS:<TAPELIB>VTAPE MTAu:          ! at EXEC level, with u being
                                 ! the device number
```

or

```
VTAPE SCAN> START                ! at SCAN Mode level
```

Please refer to page 10 for the output from the scan mode display).

The following commands are available when a question mark is typed:

```
VTAPE SCAN>  ? one of the following:
 DISPLAY     ERRORS      NO          OUTPUT      POSITION
 READ        REWIND      SHOW        START
```

The DISPLAY command, callable by:

VTAPE SCAN> **DISPLAY {type}** (2-14)

sets the output display format to one of the following "types". An example for each of these display modes can be found in Section 3.

ALL Means that both TEXT and BYTES information will be displayed for each record on the tape. The format will contain the numeric value for the byte and its corresponding text character.

---

[10] The buffer size is always displayed in words. For example, in industry compatible mode, the real buffer size is (4 chars./word x 4096 words) = 16,384 chars.

BYTES Means that only the byte information will be displayed for each record on the tape. The format will contain the numeric value for the byte in the given OUTPUT-RADIX (default is octal).

NONE Turns off both byte and text displays.

OUTPUT-RADIX Sets the radix for the numeric byte display. The default is octal or radix 8, but may any value from binary (or 2) to 36. For example, the letter "A" is represented as 065 decimal or 101 octal.

TEXT Turns on the display of text characters. When this subcommand is used, only the text will be displayed. Byte information is turned off. This allows the user to get approximately 65 characters versus 16 bytes on a display line.

WIDTH Sets the display width. The default is to use the current terminal width but it may be set wider or narrower as desired.

VTAPE SCAN> **ERRORS** (are to be shown) (2-15)

Turns on the error reporting features. This is the opposite of the NO ERRORS command. Error reporting is on by default.

VTAPE SCAN> **NO {command}** (2-16)

Turns of the effect of **command**. The currently defined commands are: REWIND, which turns off the automatic rewind that is done before the formatting display; and ERRORS, which turns off error reporting.

VTAPE SCAN> **OUTPUT** (information to) **{output file}** (2-17)

Sends any display or formatting information to the specified output file. The default is to output to the user's terminal (or TTY:).

VTAPE SCAN> **POSITION** (magtape at) **{option}** (2-18)

Positions the magtape. This command turns off the automatic rewind before scanning the magtape. One of the following options may given:

BOT Places the magtape at the beginning of the tape.

EOT Positions the magtape at the logical end-of-tape (EOT). The logical EOT is defined to be two end-of-file (EOF) marks with nothing in between.

M (files and) N (records)
Skips **M** files and then **N** records. Each file may contain several records. Files and records may be skipped in a backward or forward directions by

giving a negative or a positive number respectively. For example, to skip the next record, the user would type POSITION 0 1.

VTAPE SCAN> **READ** {opt1} (bytes from) {opt2} (records) (2-19)

Reads the number of bytes (opt1) from the requested number of records (opt2). The requested number of bytes can be one of the following:

ALL Displays all the bytes or text in a record. Lines longer than the display width will be split and continued on the next line.

OPTIMAL Displays the first N bytes that will fit within the width specified.

Number of bytes Displays the given number of bytes from each record. Lines longer than the display width will be split and continued on the next line.

The number of records read may be given by the keyword **ALL** or some decimal number of records. VTAPE will display either the whole file or the specified number of records whichever is lesser.

VTAPE SCAN> **SHOW** (current SCAN settings) (2-20)

Shows the current settings at this command mode. The following is an example of the output returned by this command.

```
Magnetic Tape Device:  MTA1:
   MTA1: is currently positioned after file 4, 27 records from BOT.

   Output to TTY:

   Error Reporting:  On
   Buffer size:  8 Page(s), or 10000 octal = 4096 decimal words
   Density:  1600 BPI (63 rows/mm)          Parity:  Odd.
   Hardware mode:  Industry compatible mode (8-bit bytes, 32-bit words)

   Record Display:
          Text in ASCII.
          Width is 80 columns.
          The FIRST 69 bytes  per record will be shown (calculated).
          All records of a file will be shown.
   The tape will be rewound at the start.
```

The display will show which magtape device is being used, what position the tape is at (could be at beginning of tape or BOT), what the maximum buffer size is. The status of error reporting, density, parity, and hardware mode used in reading the magtape are also displayed. If the Record Display is on then exactly what will be output is shown. The status of the automatic rewind feature is also shown.

VTAPE SCAN> START (processing of the tape) (2-21)

Starts processing the magtape. All output will go to the output file specified. The magtape is first rewound (if the REWIND option is on), then the format and display information is given until the logical end-of-file. At EOT, the user is returned to the VTAPE SCAN> prompt to allow for further commands. The tape is not rewound at the end of the tape.

Examples of the display and formatting information can be found in Section 3 on Examples of Use.

2.6.4 COPY Mode

The main purpose of this mode is to allow the user to copy the information from the magnetic tape to some other medium of storage. There exist commands to set the block size, the record size, end of record and error processing. To enter this mode, the user need only type **COPY** to the "VTAPE>" prompt.

The following commands are available when a question mark is typed:

```
VTAPE COPY>  ? one of the following:
 BLOCK-SIZE    CRLF          ERRORS          FILE
 NO            POSITION      RECORD-SIZE     REWIND
 SHOW
  or output filespec
```

The output filespec may be any filename. If a filename is the only thing given then the current file on the magtape will be copied to that location using the predesignated settings.

VTAPE COPY> **BLOCK-SIZE** (number of ...
... records per block) **{Number}** (2-22)

The block size is defined to be the **number** of records comprising one block. The default used depends on the type of hardware mode in use. It the tape was scanned then the default may be changed. The SHOW command will display the current block size.

VTAPE COPY> **CRLF** (exist in the file) (2-23)

This command implies that the records contained in the magtape file are separated by a CRLF[11] pair wherever it is required.[12] The opposite of this command is **NO CRLF** which means that an implicit CRLF must be inserted after every **RECORD-SIZE** characters.

---

[11] Carriage Return and Linefeed characters.

[12] Variable length records are one example of this.

VTAPE COPY> **ERRORS** (are to be shown) (2-24)

Turns on the error reporting features. This is the opposite of the NO ERRORS command. Error reporting is on by default.

VTAPE COPY> **FILE** (name to place tape file) {**name**} (2-25)

This command will start copying the current file on the magtape to the designated **name**. If the automatic rewind feature is enabled then the tape will be rewound before the file is transferred.

VTAPE COPY> **NO** {**option**} (2-26)

Turns off various features. The currently defined commands are: REWIND, which turns off the automatic rewind that is done before the formatting display; ERRORS, which turns off error reporting; and CRLF, which implies the records are of a fixed length.

VTAPE COPY> **POSITION** (magtape at) {**option**} (2-27)

Positions the magtape. This command turns off the automatic rewind before scanning the magtape. One of the following options may given:

BOT Places the magtape at the beginning of the tape.

EOT Positions the magtape at the logical end-of-tape (EOT). The logical EOT is defined to be two end-of-file (EOF) marks with nothing in between.

M (files and) **N** (records)
Skips **M** files and then **N** records. Each file may contain several records. Files and records may be skipped in a backward or forward directions by giving a negative or a positive number respectively. For example, to skip the next record, the user would type POSITION 0 1.

VTAPE COPY> **RECORD-SIZE** (number of characters ...
... per record) {**number**} (2-28)

This command sets the **number** of characters (N) in a data record. Fixed length records will always have an implied CRLF after N characters are read in. The default value for the record size varies depending on the hardware mode and if the tape has been scanned. Please verify its value with the SHOW command.

VTAPE COPY> **REWIND** (before checking the tape) (2-29)

Turns on the automatic rewind feature. If this feature is enabled, the magtape is rewound before all other operations performed on it. The opposite of this command is the NO REWIND command.

VTAPE COPY> **SHOW** (current COPY settings) (2-30)

Shows the current settings at this command mode. The following is an example of the output returned by this command.

```
Magnetic Tape Device:  MTA1:
    MTA1: is currently positioned at beginning of tape.

    Hardware mode:  Industry compatible mode (8-bit bytes, 32-bit words)

    Error Reporting:  On
    Buffer size:  8 Page(s), or 10000 octal = 4096 decimal words
    Density:  1600 BPI (63 rows/mm)          Parity:  Odd.

    Block-Size:  20                      Record-Size:  80
    Assuming CRLFs do not exist in the input magtape file.
    The tape will NOT be rewound at the start.
```

The display will show which magtape device is being used, what position the tape is at (could be at beginning of tape or BOT), what the maximum buffer size is. The status of error reporting, density, parity, and hardware mode used in reading the magtape are also displayed. The blocking size in records/block and record size of characters per record are shown. The existence of CRLF's in the file which will be used is displayed. The status of the automatic rewind feature is also shown.

2.6.5 Summary of the Command Modes

Once Program VTAPE is run the user is prompted for a magnetic tape device. The option of automatically scanning the magtape or entering into the command modes is presented. There are three major modes of commands: Global Magtape Parameters (or TOP Level), SCAN mode, and COPY mode.

The TOP level commands set the hardware mode for read operations, the density and parity of the magnetic tape drive. SCAN mode commands are used to preview the magtape, and to determine the format that it was written in. COPY mode is then used to transfer the information from the magtape to online disk storage.

2.7 Restriction and Limitations

The current version of VTAPE cannot be used on labeled tapes using filename recognition. Upon scanning the tape, the volume headers, file headers and trailers will appear as records containing 80 characters, while the body of the file may be different in both size and hardware mode.

2.8 Entry and Exit

VTAPE is an interactive program callable from the EXECutive Level of the operating system, and as such returns to this level upon completion.

2.9 Testing and Verification

VTAPE was tested on many magtapes with known formats. The DEC and IBM EBCDIC translation tables were verified using magtapes written at installations using those vendors. The TEKTRONIX EBCDIC translation table is based on IGL installation tapes sent to us by Tektronix, Inc. **[IGL, 1982]**. The different hardware modes and formats were verified by writing known data onto a magtape in that format and then using VTAPE to obtain the original data.

2.10 Memory Requirements

VTAPE requires 21 pages, or 10.5K words of memory on the DEC-20.

3 Examples of Use

In this section, some examples will be presented on the different capabilities available with the VTAPE program. Assume that MTA1: has been assigned to the user for all the examples in this section. The necessary commands to get the given results will be given in a concise fashion. Please refer to the appropriate input line if more detail is required.

3.1 Obtaining the Blocking Format

In brief, this example is a quick way to obtain the format of the magtape assuming it is in some industry standard mode such as ASCII, or EBCDIC. The blocking format is obtained for each record and file on the magtape until a logical End of Tape.

By default, VTAPE assumes the INDUSTRY-STANDARD hardware mode for its operations. This assumption is generally valid for all external tapes that we receive. To get an output describing the format of the magtape, type at EXEC level:

```
(1)     PS:<TAPELIB>VTAPE                                   Line (2-2)
        Device: MTA1: CR                                    Line (2-3)
or
(2)     PS:<TAPELIB>VTAPE MTA1: CR
or
        PS:<TAPELIB>VTAPE                                   Line (2-2)
(3)     Device: MTA1:, CR                                   Line (2-3)
        VTAPE> SCAN                                         Line (2-12)
        VTAPE SCAN> START                                   Line (2-21)
```

Group (1), (2) and (3) assume Industry Standard format, yet in group (3) the hardware mode could be changed as required (see Line (2-9)). A similar output to the following would be obtained.

```
--- Start of Tape ---[1]
    1F.[2] Record length:   1600(8)[3]   Record count:     3[4]
         --- EOF ---[5]
    2F.  Record length:   1600(8)    Record count:     3
         --- EOF ---
                .
                .
                .
--- End of Tape ---[6]
```

In the preceding figure, the following notes are applicable:

1) The "Start of Tape" message is displayed whenever the scanning starts at the BOT, or Beginning of Tape marker. The tape will always start at BOT if the automatic rewind feature is turned on.

2) The number "1F." implies that the rest of the information on that line reflects file 1 on the magtape. The file numbers are counted from BOT always.

3) "1600(8)" means that the record length is 1600 bytes, where one byte is 8 bits in length. Greater detail on the hardware modes and their respective byte sizes may be found on page 6.

4) The number of records of the same length is placed here.

5) An End of File mark was found implying either another file or the End of Tape mark will be next.

6) The "End of Tape" message implies that two EOF marks were found with nothing in between them. The program positions the magtape between the two EOF marks and then returns to the user for further instructions.

3.2 Displaying the Text Contents

The following example will illustrate a method to look at the text contents of the magtape without actually copying it. Assume that the tape in Industry-Standard format, then typing:

```
PS:<TAPELIB>VTAPE                                          Line (2-2)
Device: MTA1:, CR                                          Line (2-3)
VTAPE> SCAN                                                Line (2-12)
VTAPE SCAN> DISPLAY TEXT                                   Line (2-14)
VTAPE SCAN> READ OPTIMAL                                   Line (2-19)
VTAPE SCAN> START                                          Line (2-21)
```

These commands inform VTAPE to display only the text portion of the record's contents, and to read from the record as many bytes as can fit on the screen in one line. The use of the SCAN mode SHOW command, used before the START command, would illustrate the preceding points.

Once started, the program would output in the following format:

```
--- Start of Tape ---
A[1]    1R.  C       <GERGELY.IGL>SIGN.FOR.82, 24-Jul-80 12:11:45, Edit by
A       2R.[2]       TYPE 1000[3]
A       3R.          call text(64,itext1)
    1F.  Record length:   1600(8)    Record count:      3[4]
         --- EOF ---
A       1R.  C       <GERGELY.IGL>S.FOR.25,  7-Apr-81 08:11:20, Edit by GE
A       2R.          call grain(0.0)
A       3R.          CALL TYPSET(42,'!HOM0.8;!CEN;!SLT10.0;Presentation!LIN1
A       4R.          call txfont(IFONT)
A       5R.          CALL TYPSET(16,'!SCA0.0;!SCA4.0;')
A       6R.          IF(IBAUD.LE.600)IFONT=6
A       7R.  900     call newpag
    2F.  Record length:   1600(8)    Record count:      7
         --- EOF ---
         .
         .
         .
--- End of Tape ---
VTAPE SCAN>
```

The following notes apply to the previous example.

1) The letter in this column denotes the format that has been chosen for the read. The letter "A" is used for ASCII (in industry standard), or "E" for EBCDIC. The translation table for EBCDIC is not displayed, but the use of the SHOW command will notify the user of it.

2) A record index is denoted by some number followed by "R.". This is used to differentiate from the file index designated by "F.".

3) The ASCII text contained in record is displayed here. The program will translate the EBCDIC code into ASCII for viewing purposes.

4) The file summary is shown here as explained in Section 3.1.

3.3 Displaying Both the Byte and Text Contents

The following example will illustrate a method to look at both the byte and the text contents of the magtape without actually copying it. Assume that the tape in Industry-Standard format, then typing:

```
PS:<TAPELIB>VTAPE                                    Line (2-2)
Device: MTA1:, CR                                    Line (2-3)
VTAPE> SCAN                                          Line (2-12)
VTAPE SCAN> DISPLAY ALL                              Line (2-14)
VTAPE SCAN> READ OPTIMAL                             Line (2-19)
VTAPE SCAN> START                                    Line (2-21)
```

These commands inform VTAPE to display both the byte and the text portion of the record's contents, and to read from the record as many bytes as can fit on the screen in one line. The use of the SCAN mode SHOW command, used before the START command, would illustrate the preceding points.

Once started, the program would output in the following format:

```
--- Start of Tape ---
     1R.  103 040 040 040 040 040 040 040 074 107 105 122 107 105 114[1]
ASCII[2]      C                                 <   G   E   R   G   E   L [3]

     2R.  040 040 040 040 040 040 124 131 120 105 040 061 060 060 060
ASCII                              T   Y   P   E       1   0   0   0
     3R.  040 040 040 040 040 040 143 141 154 154 040 164 145 170 164
ASCII                            c   a   l   l       t   e   x   t

    1F.  Record length:   1600(8)    Record count:      3
         --- EOF ---
        .
        .
        .
--- End of Tape ---
VTAPE SCAN>
```

Apply the following notes to the preceding example.

1) The bytes are output in the current radix as set by the DISPLAY OUTPUT-RADIX command. The number refers to the value of the byte which corresponds to the character directly under it.

2) Either ASCII or EBCDIC will be displayed in this field depending on the hardware modes chosen.

3) The characters displayed are in ASCII and correspond to the numeric byte directly above them.

3.4 Copying a File from Magtape

Finally after you know the format of the magtape, which would include the blocking format and hardware mode, you can copy the magtape files onto the disk area belonging to yourself. The default in copy mode is:

```
1 block = 1 record * 80 characters/record
        = 80 characters.
```

If the record length is different, then the block size will have to be adjusted accordingly. After a scan has been run, the block size is set by dividing 80 characters into the record length found.

For this example, let us assume that the files on the magtape have a block size of 3200 characters or 40 records of 80 characters each. The following sequence of commands will copy the files on the magtape into FILE1.TXT, FILE2.TXT, FILE3.TXT ... until the End of Tape is reached. This also assumes that the files are all of equal block size.

```
PS:<TAPELIB>VTAPE                                   Line (2-2)
Device: MTA1:, CR                                   Line (2-3)
VTAPE> COPY                                         Line (2-5)
VTAPE COPY> BLOCK-SIZE 40                           Line (2-22)
VTAPE COPY> POSITION BOT[13]                        Line (2-27)
VTAPE COPY> FILE1.TXT[14]
VTAPE COPY> FILE2.TXT[15]
.
.
.
```

---

[13] Positions the magtape at the beginning of the file and turns off the automatic rewind feature

[14] The filename on the user's directory that the file on magtape should be placed into.

[15] The second file

This may be continued until the end of tape is reached, and VTAPE will abort the copying process returning to the user for more instruction.

3.5 Advanced Features

3.5.1 Error Reporting

VTAPE will report any magtape errors that are encountered unless the NO ERRORS command has been given. The program will recover and bring the user back to the current command level.

If a block is read during COPY mode that is smaller or larger then the block size, a warning is given and processing continues. If CRLF pairs are being inserted by VTAPE (see Line (2-23)), then they will continue to be inserted every record-size number of characters.

3.5.2 Reading Past the End of Tape

VTAPE may be used to recover information past the logical end-of-tape by the following procedure: Scan the magtape until the end-of-tape is encountered by typing:

```
PS:<TAPELIB>VTAPE                                   Line (2-2)
Device: MTA1:, CR                                   Line (2-3)
VTAPE> SCAN                                         Line (2-12)
VTAPE SCAN> START                                   Line (2-21)
```

This will SCAN the magtape to the end of tape. At this time, type:

```
VTAPE SCAN> POSITION 0 1                            Line (2-18)
```

which instructs VTAPE to skip the next record (i.e. the second EOF making the logical EOT mark).

NOTE: Reading past the logical EOT mark is very dangerous as the tape may be empty from that point on. Reading an empty tape will cause the tape to spin forward until the physical EOT mark is found on the magtape. Serious problems occur if the physical EOT is not on a magtape. The usual effect of this running off the end of a physical magtape is to hang ALL the magtape drives on the computer system.

4 Concluding Remarks

We have described a program for the viewing, deciphering, and reading foreign magnetic tapes. Though other programs exist for reading magtapes of specific external formats, this is the only one available to the author's knowledge for the viewing and deciphering of the magtape interactively. Furthermore, additional formats that have not been described in this note are available, and the author will gladly provide them as the need arises.

This program should be the first one used to check the format of any magtape of unknown or doubtful characteristics. It may be used by the scientist or the computer user alike without the prerequisite of detailed knowledge on the technical aspects of magnetic tapes.

Appendix A

Quick Reference to Input Requirements

A quick guide to the assorted input will be presented.

A.1 Getting Started

RUN PS:<TAPELIB>VTAPE	Line (2-1)
PS:<TAPELIB>VTAPE	Line (2-2)
Device: **MTAu: {comma + CR, or CR}**	Line (2-3)

A.2 Global Magtape Parameters

VTAPE> **BUFFER-SIZE** (maximum is) **{pages}**	Line (2-4)
VTAPE> **COPY** (submode)	Line (2-5)
VTAPE> **DENSITY** (of the magtape is) **{density}**	Line (2-6)
VTAPE> **ERRORS** (are to be shown)	Line (2-7)
VTAPE> **HELP** (on) **{subject}**	Line (2-8)
VTAPE> **MODE** (type is) **{hardware mode}**	Line (2-9)
VTAPE> **NO ERRORS** (are to be shown)	Line (2-10)
VTAPE> **PARITY** (of the magtape is) **{parity}**	Line (2-11)
VTAPE> **SCAN** (submode)	Line (2-12)
VTAPE> **SHOW** (current settings)	Line (2-13)

A.3 SCAN Mode

VTAPE SCAN> **DISPLAY {type}**	Line (2-14)
VTAPE SCAN> **ERRORS** (are to be shown)	Line (2-15)
VTAPE SCAN> **NO {command}**	Line (2-16)
VTAPE SCAN> **OUTPUT** (information to) **{output file}**	Line (2-17)
VTAPE SCAN> **POSITION** (magtape at) **{option}**	Line (2-18)
VTAPE SCAN> **READ {opt1}** (bytes from) **{opt2}** (records)	Line (2-19)
VTAPE SCAN> **SHOW** (current SCAN settings)	Line (2-20)
VTAPE SCAN> **START** (processing of the tape)	Line (2-21)

A.4 COPY Mode

VTAPE COPY> **BLOCK-SIZE** (number of ... ... records per block) {**Number**}	Line (2-22)
VTAPE COPY> **CRLF** (exist in the file)	Line (2-23)
VTAPE COPY> **ERRORS** (are to be shown)	Line (2-24)
VTAPE COPY> **FILE** (name to place tape file) {**name**}	Line (2-25)
VTAPE COPY> **NO** {**option**}	Line (2-26)
VTAPE COPY> **POSITION** (magtape at) {**option**}	Line (2-27)
VTAPE COPY> **RECORD-SIZE** (number of characters ... ... per record) {**number**}	Line (2-28)
VTAPE COPY> **REWIND** (before checking the tape)	Line (2-29)
VTAPE COPY> **SHOW** (current COPY settings)	Line (2-30)

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13. ABSTRACT

The program VTAPE describes a procedure for deciphering magnetic tapes having unknown formats as normally obtained from external sites. It may be used to determine the format of the magnetic tape and to copy its contents to some directory or file space on the disk structure. Also, commands are included to set the hardware parameters (density, parity and hardware data mode) as well as to permit command recognition and provide internal help.

Furthermore, the description gives the two main modes of operation: the first allows deciphering formats, positioning the tape, and viewing the magtape contents; the second allows for copying of the magtape contents, positioning the tape and setting the blocking format for copying. In addition, advanced features, such as error reporting, are provided.

Finally, examples are included to facilitate its use, either interactively or in batch mode, by the scientist or other user who might not be familiar with the technical aspects of magnetic tapes.

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